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FAA Representatives Attend SBAS Interoperability Working Group (IWG) Meeting in Toulouse, France

Satellite navigation experts from the Federal Aviation Administration (FAA) met with more than 50 colleagues from around the world at the 24th meeting of the Satellite Based Augmentation System (SBAS) Interoperability Working Group (IWG) held in Toulouse, France on January 24th and 25th, 2013. This was the first meeting to be attended by all five current SBAS service providers and implementers (the United States, Japan, Europe, India, and Russia).

SBAS systems monitor GPS through a dispersed set of ground receivers and then broadcast corrections and integrity information

to users in a broad region using geosynchronous satellites. The resulting accuracy improvements, together with information on integrity or the reliability level of the signals, renders satellite navigation suitable for the vertical (as well as horizontal) guidance of aircraft. SBAS also enables a range of other precision applications.

The first IWG meeting was held in 1997, and has become the forum for SBAS service providers to assure common understanding and implementation of International Civil Aviation Organization (ICAO) Standards And Recommended Practices (SARPs). The SARPs provide overarching standards and guidance for global SBAS implementation. The coordination at IWG enables the SBAS service providers to develop their respective SBAS systems in a manner that is consistent, enabling the interoperability of aviation equipment with all SBAS.

This IWG meeting included representatives from Russia's System of Differential Correction and Monitoring (SDCM), under

development by Russian Federal Space Agency (Roscosmos), and India's GPS and Geo-Augmented Navigation (GAGAN) system, under development by the Indian Civil Aviation and the Indian Space Research Organization (ISRO) space agency.

The meeting was jointly hosted by the ESA's European Geostationary Navigation Overlay System (EGNOS) and the SBAS Division within the French space agency Centre National d'Etudes Spatiales (CNES). International organizations such as Eurocontrol, the European Organization for the Safety of Air Navigation, also attended.

Today, there are three certified SBAS services operational worldwide:

1. Europe has EGNOS, designed and developed by ESA, and operated by the European Satellite Service Provider (ESSP) and owned by the European Commission. EGNOS

The *SatNav News* is produced by the Navigation Programs AJM-32 branch of the Federal Aviation Administration (FAA). This newsletter provides information on the Global Positioning System (GPS), the Wide Area Augmentation System (WAAS) and the Ground Based Augmentation System (GBAS).

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was made available for general users in 2009 and for aircraft landing approaches in March 2011.

2. The USA has the Wide Area Augmentation System (WAAS), developed and operated by the FAA, with an extension over Canada called CWAAS (Canadian WAAS). WAAS infrastructure also exists in Mexico. WAAS was commissioned in 2003.
3. Japan has the Multi-functional Satellite Augmentation System (MSAS), developed and operated by Japan's Civil Aviation Bureau. MSAS was commissioned in 2007.

During the meeting members presented the status and performance of their systems. Members discussed the interpretation of existing requirements for Lateral Precision with Vertical Guidance (LPV) with 200 ft. Decision Height (DH), or LPV-200, in an effort to coordinate a joint position on a path forward to resolve concerns with the requirements.

Members also discussed the framework and various architectures for the future SBAS dual/multi-frequency service. FAA representatives presented

an overview of a draft Interface Control Document (ICD) that would support a dual-frequency WAAS user in addition to supporting the use of multiple GNSSs. The ICD identifies the messages and message parameters broadcast by the SBAS service provider. The ICD will support the future development of avionics or other equipment capable of using the SBAS signal. Agreement between all the SBAS providers on how the future service provision will be specified will enable a Dual-Frequency/Multi-constellation user to operate using any SBAS provider.

The Russian delegation extended an invitation to host IWG 25 to be held in June 2013.

- Scott Speed, FAA AIM-321/NAVITAC

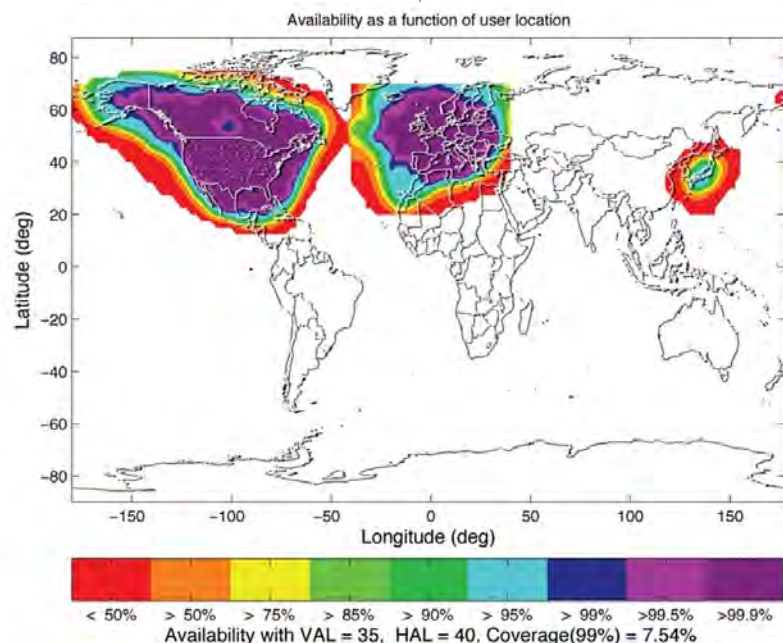
United Airlines Flights Start Using GBAS in IAH Approaches

On April 22, 2013 a United Airlines flight from San Antonio landed at George Bush Intercontinental Airport (IAH) in Houston, Texas using the Ground Based Augmentation System (GBAS), a differential correction system that augments GPS to provide improved accuracy and integrity to aircraft in the vicinity of an airport.

The Houston GBAS installation is part of a Government Industry Project (GIP) with the Federal Aviation Administration (FAA), Houston Airport Systems (HAS), United Airlines, and Honeywell Aerospace intended to establish operational experience with a fully certified GBAS system over the next several years. The system is a non-Federal system, fully operational and FAA approved, owned and operated by HAS. The operational experience will facilitate the development of Category III (CAT III) GBAS systems. Newark Liberty International Airport was the first airport in the National Airspace System (NAS) to install GBAS. The Newark system became fully operational September 28, 2012. Aviation Week's 2013 Laureate Award in the IT/Electronics category was awarded to the Port Authority of New York and New Jersey, Honeywell, and the FAA GBAS team for the successful implementation of GBAS at Newark Liberty Airport.

The systems at Newark and Houston now provide a GBAS city pair for use by United Airlines and increased operational experience with the technology. United Airlines has over 50 GBAS equipped aircraft operational capable of utilizing GBAS Landing System (GLS) approaches at IAH and EWR.

Public GBAS CAT I operations require the use of a Service Prediction Tool. The tool was developed by the Navigation Branch (ANG-C32) of the Engineering Development Services Division, Advanced Concepts & Technology Development Office. The tool uses current state data in the development of forward predictions of GBAS service to the airport, ATC and the users. Using stored GBAS facility monitor data and almanac data the system provides vertical protection level (VPL) predictions over the next 50 hours. This information is used to generate NOTAMS concerning system non-availability. This information can then be used for flight planning purposes. The operators of both the Newark and Houston facilities have





been given training concerning the operation of the tool.

Both major Original Equipment Manufacturers (OEMs), Boeing and Airbus, provide for GBAS capability in their fleets. GBAS is available as an option in Boeing 737 aircraft and standard equipment in B787 and B747-8 aircraft. AIRBUS implemented GBAS as optional equipment in the A320 and A380 and plans to certify A330/340 and A350 with GBAS capability.

The goal of the FAA GBAS research and development effort over the next few years is to produce an operationally approved CAT III system. The strategy is to evolve the architecture developed and approved for a single frequency GBAS CAT-I service and improve this architecture to provide CAT II/III service. GBAS standards for GAST-D, a service type equivalent to ILS CAT III, were baselined within an ICAO Navigation Systems Panel proposed amendment to the Annex 10 Standards and Recommended Practices (SARPS). Current CAT II/III planning focuses

on reducing technical risk through prototyping and requirements validation. This approach is consistent with international GBAS efforts. The FAA has several activities in place to provide validation products as well as operational prototypes for cooperative testing.

The Boeing Company installed their own GBAS SLS-4000 at Moses Lake as a private system for the sole use of Boeing to certify Boeing aircraft and aircrews. They also plan to use the system for validation and testing of GBAS CAT II/III avionics and aircraft interfaces. The FAA is working with Boeing at this installation to gain insight into their CAT III aircraft approval strategy and leverage their CAT III efforts for FAA validation work.

An FAA-owned SLS-4000 installed in Atlantic City International Airport (ACY) will continue to be used as an interim platform to develop and validate Category III requirements under this project. Alternative architectures for potential development and procurement to provide future GNSS Category II/III services will be investigated during this work.

The GBAS Category III development schedule calls for Non-Federal System approval in the summer of 2016. Most ground facility studies are proceeding as planned.

The FAA GBAS team continues to work with the international community on the implementation and development of GBAS through the International GBAS Working Group (IGWG). The IGWG is co-chaired by FAA and EUROCONTROL and serves as the forum for international GBAS technical and operational information exchange, coordination of GBAS activities, and establishment of joint projects, analysis tools, and

documents for GBAS development and implementation.

IGWG members are FAA, EUROCONTROL, international service providers (for example Australia, Germany, Spain, United Kingdom, Switzerland, Japan, Italy, Russia, and Korea), European and U.S avionics industry, airline representatives, and Boeing and Airbus.

Fourteen nations presently have GBAS related activities in one form or another from concept development and research prototype activities to actual implementation, some with airline GBAS operations under revenue.

The next IGWG is hosted by the FAA and Boeing in Everett, WA on June 4 -7, 2013.

-Dieter Guenter, FAA AJM-321/NAVTAAC

FAA Alternative Airport Policy Change

Thunderstorms? Fog? Winter storms? Flight planning with unfavorable weather at your destination can make for the beginning of a tough flying day. Having one or more suitable alternate airports is always welcomed by pilots and can help assure safety. Currently, pilots equipped with the Global Positioning System (GPS) and the Wide Area Augmentation System (WAAS) have thousands of GPS-based instrument approach procedures (IAP) to utilize in the US National Airspace System (NAS). However, for years, only pilots with WAAS navigation equipment could plan to use a GPS-based IAP at their alternate airport. This enabled the WAAS equipped operator access to more choices for alternates than their GPS counterpart who had to find a qualified conventional IAP. As the United States decreases the number of non-GPS based navigational aids and transitions to a satellite-based infrastructure, pilots could face a daunting task in their quest to find an alternate with a non-GPS based IAP.

Good news! The FAA has updated its alternate airport planning policy to



provide additional flexibility for pilots flying with GPS and WAAS navigation systems. Pilots with GPS navigation systems with fault detection and exclusion (FDE) capability may now plan for a GPS-based IAP at their destination OR alternate airport (not both locations). Those with approved barometric vertical navigation (baro-VNAV) equipment may plan to use the lateral navigation/vertical navigation (LNAV/VNAV) line of minima at the alternate airport. Those without baro-VNAV will still have an alternate option by planning for the LNAV line of minima. Pilots with WAAS navigation systems may still plan for GPS-based IAP at their destination AND alternate airports. However, WAAS users that use baro-VNAV for vertical information on final approach may now plan for the LNAV/VNAV line of minima at the alternate airport instead of being limited to the LNAV line of minima. For a copy of this policy, reference the Federal Aviation Administration's (FAA) Notices to Airmen Publication (NTAP), Part 4 Graphic Notices - General section, beginning with the April 4, 2013 edition. (http://www.faa.gov/air_traffic/publications/notices/). The FAA is updating Orders, Advisory Circulars, inspector guidance, the Aeronautical Information Manual/ Publication and other guidance

documents to incorporate this new information.

- FAA Aviation Safety (AVS)

Flight Standards Presents New Helicopter Criteria at HAI Convention

Las Vegas, Nevada was the site of the Helicopter Association International (HAI) Heli-Expo 2013 convention, on March 4th – 7th. HAI hosted 60 helicopters, 736 exhibitors, and 20,393 attendees, making it once again the world's largest helicopter trade show and exposition.

During the convention, the HAI Flight Operations Committee held a forum where Mike Webb of the Federal Aviation Administration's (FAA) Flight Standards Service gave an enlightening update on new helicopter criteria appearing in FAA Order 8260.42B. The order contains the criteria for the formulation, review, approval, and publication of Area Navigation (RNAV) helicopter instrument procedures based on the Global Positioning System (GPS) and Wide Area Augmentation System (WAAS) navigation. The mostly 'chopper' pilot crowd met this new criteria with rousing approval and clamored for more criteria as soon as possible. Mr. Webb cited the efforts of

his Flight Standards colleagues, the pilot community, HAI, and the FAA's Navigation Programs office with its harnessing of resources both inside and outside of the FAA to complete a project that facilitated approval of the new criteria. The changes put forth in FAA Order will set safety as the primary goal for vertical flight. With the innovations made possible by satellite navigation technology, the FAA has demonstrated its ability to lead the worldwide move to helicopter safety. The resulting benefits will also enhance mixed aircraft operations.

-Jim Smith, FAA A/JM-321/NAVTAC

Delta to Install NextGen Enabling Avionics

In April, 2013, Delta Air Lines has announced that it will outfit its fleet of 182 MD-88 and MD-90 aircraft as well as several flight simulators with standardized, state-of-the-art glass cockpits and augmented GPS navigation that will improve efficiency, reduce environmental impact, and position the airline to take advantage of procedural improvements outlined in the Federal Aviation Administration's Next Generation Air Transportation System.

The enhanced avionics suite, developed by Innovative Solutions & Support, Inc. (IS&S), employs an open architecture, flat panel display system that allows operators to upgrade their aircraft to a glass flight deck while leaving third party avionics installed in the aircraft. The flight management system supports RNAV and RNP procedures which result in improved efficiencies. This will allow the aircraft to fly shorter flight paths and take advantage of optimum profile descents (OPD) and RNAV procedures which will reduce fuel consumption, carbon emissions, and noise levels — primary objectives of NextGen.

Installation of the enhanced flight deck technology across the MD-88 and MD-90 fleet is slated to begin in November 2013 and will be completed by IS&S technicians at Delta TechOps

facilities. The process is expected to take approximately two years, the company added.

- Scott Speed, FAA AJM-321/NAVTAC

What's New on the Web!

Where can you find FAA Satellite Navigation Program information in between editions of the SATNAV News? Please visit our website - <http://gps.faa.gov>. Recently, we have added a new WAAS status briefing to under the Satellite Navigation Library section; added the latest WAAS Quarterly Status Report; and posted updated numbers on WAAS approach procedure development. Also, on our website, you can find information about how GPS, WAAS, and GBAS work; an archive of past SATNAV News editions; and fact sheets. We are always looking for ways to improve the website and love your suggestions, so please feel free to send them to MaryAnn.CTR.Davis@faa.gov. In the meantime, we are working on major updates to many of the existing pages. More on that in the next SATNAV News!

Satellite Navigation Approach Procedures Update

In this edition, we are adding information about GBAS Landing System (GLS) approach procedures to the Satellite Navigation Approach Procedures Update. Aptly named, GLS approach procedures are flown using GBAS. Currently, there are eleven GLS approach procedures in the U.S. These are located at Newark Liberty International in Newark, New Jersey and at George Bush Intercontinental Airport in Houston, Texas. The Satellite-based Approach Procedures table reflects

the continuing growth of all types of satellite navigation approach procedures. For comparison purposes, we also include a table noting the recent inventory of Instrument Approach Procedures Based on Conventional NAVAIDS.

More detailed information about satellite based instrument approach procedures, please visit our GPS/WAAS Approach Procedures page at http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/approaches/index.cfm.

- Mary Ann Davis, FAA AJM-321/NAVTAC

Satellite-based Approach Procedures (by Procedure Type)

	Procedures (Part 139 Airports)	Procedures (Non-Part 139 Airports)	Total Number of Procedures
LNAV Procedures	1,779	3,885	5,664
LNAV/VNAV Procedures	1,316	1,687	3,003
LPV Procedures (LPV w/200' HAT)	1,322	1,801	3,123 (806)
LP Procedures	58	361	419
GLS Procedures	11	0	11
GPS Stand-Alone Procedures	14	152	166

Note: Number of GPS Stand-Alone will continue to decrease as they are replaced by RNAV procedures
(Data as of May 2, 2013)

Instrument Approach Procedures (IAPs) Based on Conventional NAVAIDS

ILS	1,283
ILS (CAT II)	156
ILS (CAT III)	117
NDB	806
VOR	1,291
VOR / DME	948

(Data as of May 2, 2013)

More information is available at
https://www.faa.gov/air_traffic/flight_info/aeronav/procedures/ifp_inventory_summary/